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POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

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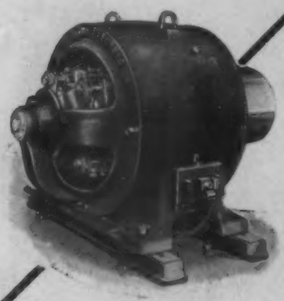

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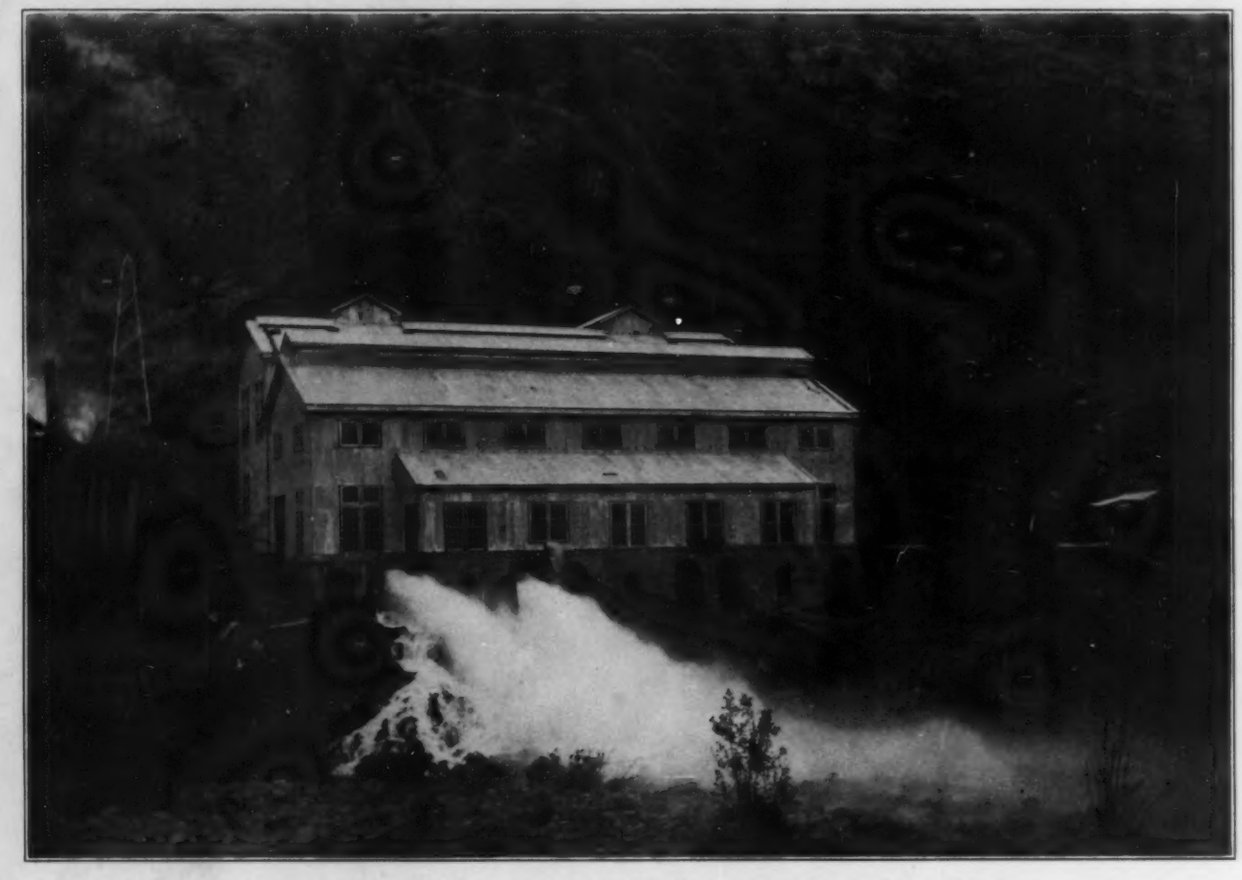
VOLUME XXIII. SAN FRANCISCO, AUGUST 21, 1909 NUMBER 8

THE STANISLAUS POWER DEVELOPMENT.

The announcement a short time ago of a new high head hydro-electric plant over which the United Railroads interests had acquired control created some surprise even among Western engineers. It was generally known that active construction work was under way on the Stanislaus River, but it was not appreciated that a plant of more than 40,000 horsepower, up-to-date in every particular, with one hundred miles of steel tower transmission line, had been completed. The plant was quietly paralleled with the big network of the Pacific Gas & Electric Company last October within a few hours after the pipe lines were completed and has been in continuous operation since.

The development has the usual characteristics: storage, diverting dam, flume, pressure pipes, power house and transmission lines, but the boldness of some of the designs and variations in detail of execution make the plant of more than passing interest.



Hydro-Electric Plant of Stanislaus Electric Power Company.

The Stanislaus, like all California mountain streams, has a wide variation between summer and winter flow. No reliable data on flow existed prior to the starting of the present work. The government

had made a few isolated measurements from time to time at different points on the river and maintained a gauging station near Knights Ferry from 1878 to 1893 and subsequent to 1903. The former, however, were taken at such infrequent intervals as to be of little value and the latter up to 1893 were apparently unreliable because they failed to take account of diversions for irrigation near Knights Ferry. The Stanislaus engineers established their own gauging station in 1902 at the site of their proposed diversion and have an excellent record since that time. A careful comparison has been made of observations on the Stanislaus and other rivers in this part of the State during the past seven years, and from these conservative estimates have been prepared of the flow in the river during the bad years to determine the storage required for the plant as designed. Probably no plant on the Coast has received more careful study from this point of view.

A marked feature of this development not possessed by most of the high head plants is found in the large forebay reservoir at the head of the pressure pipes. This forebay has an available capacity sufficient to operate the power house at full load for more than fifteen hours. This is available either to tide the plant over a temporary interruption due to break in the flume or to store water during off peak hours for use during the peak. Interruptions are more likely to occur during bad weather in the spring while high peak loads occur during the low water period in October, November and December. The plant thus possesses unusual advantages for meeting either emergency.

Relief Storage Reservoir.

The engineer has gone forty-five miles above the diversion dam to establish the first reservoir at an elevation of over 7000 feet. At the narrow outlet of a rocky valley a rock-fill restraining dam of 150 feet ultimate height is being built to store for summer use the winter run-off from the great drainage area above. This dam is particularly noteworthy in being one of the largest rock-fill dams ever constructed. Before the close of this Fall it will be brought to a height of 130 feet, and will contain nearly 150,000,000 cubic yards of granite taken from the hillside close by and delivered direct to the dam by convenient cable ways. In appearance, it is concave down-stream because of the presence of a small knoll directly in its path. From end to end

Relief Reservoir Site from Dam.
Upper Dam Face.

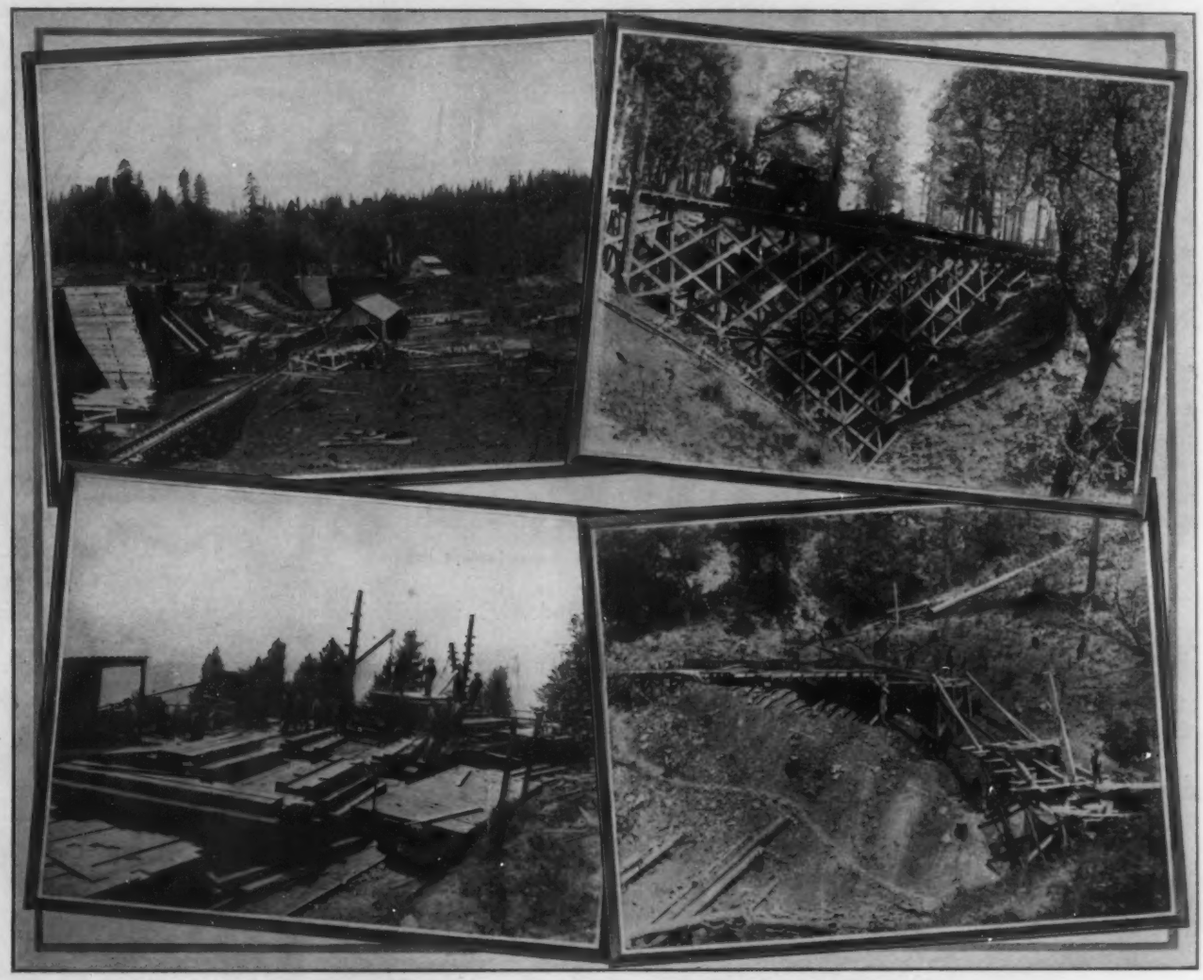
View Showing Method of Construction.
Lower Dam Face.

its crest measures 562 feet. It consists essentially of two parts: an up-stream hand-built section, and a down-stream rock-filled supporting section. As may be seen from the accompanying photographs granite blocks, derrick delivered, were carefully built up and interlocked by hand and the interstices subsequently filled with sluiced sand and earth. The rocks on the up-stream face were carefully laid with mortar to a thickness of 5 ft.; in this were inserted, at frequent intervals, iron hooks to which was fastened a steel reinforcing network to form the basis for a concrete curtain. This reinforced concrete face is 9 in. thick at the top and tapers to 18 in. 100 ft. below and to 36 in. near the bottom. The finished up-stream face has a slope of 60 degrees. The down-stream face of the hand-laid section is made up of a 5-ft. dry-laid wall, battered 1 horizontal to 10 vertical. This is backed up by a loose rock fill having a down-stream slope of 30 degrees. Outlet is provided from the bottom through a concrete culvert containing three 33-in. pipes controlled by 30-in. valves placed in a chamber in the middle of the dam, about 30 ft. from its face. This dam and reservoir gives a total storage capacity of 882,684,000 cu. ft. over an area of 232 acres.

Accompanying drawings of the plan and vertical section of the dam (pp. 152, 153) show the details of its design, which has engaged the attention of some of the most prominent engineers of the country. Various prophecies of the inability of the reinforced concrete curtain to hold water have been disproved by actual trial. The fact that this is successful where similar Government tests have failed is perhaps due to the high grade of Portland cement used in the construction. Because of excessive freight rates the initial cost of the cement was of little consequence, as any brand cost about $10 per barrel delivered.

Diversion Dam.

Forty-five miles down the river a 20-ft. rock-fill crib dam, plank-faced, has been built to divert water to the flume. The up-stream face of the dam is built on a slope of 3 to 1; the down-stream of 2 to 1. In addition, there is a concrete head-gate wall placed perpendicularly to the dam axis, and a series of ten head-gates each 3 ft. 9 in. x 7 ft. opening into a settling basin provided with eight sand pipes. From here a timber flume has been built for 78,000 ft. along the precipitous canyon walls.



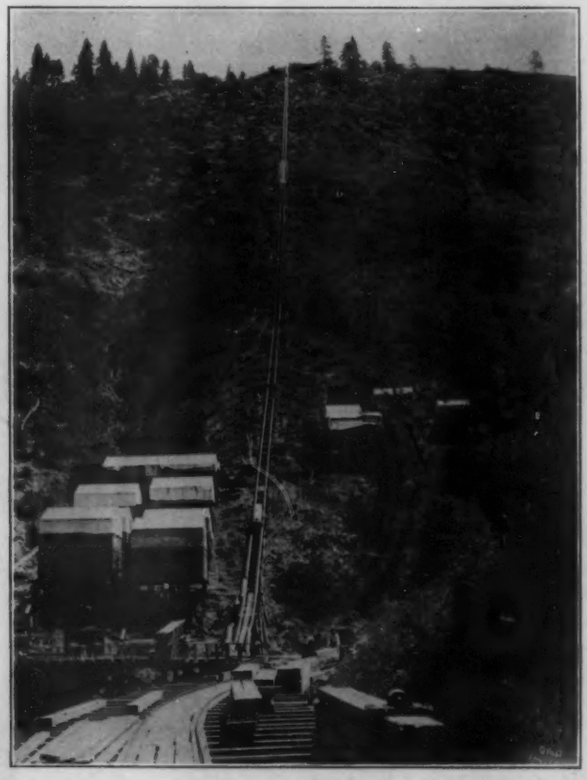
Saw Mill.
Head of Tramway.

Construction Locomotive and Railway.
Flume Construction.

Flume.

The construction of this flume involved several unusual features that make its description of interest. It is built of timber obtained from the company's own

Typical Flume Section in Stanislaus Canyon.

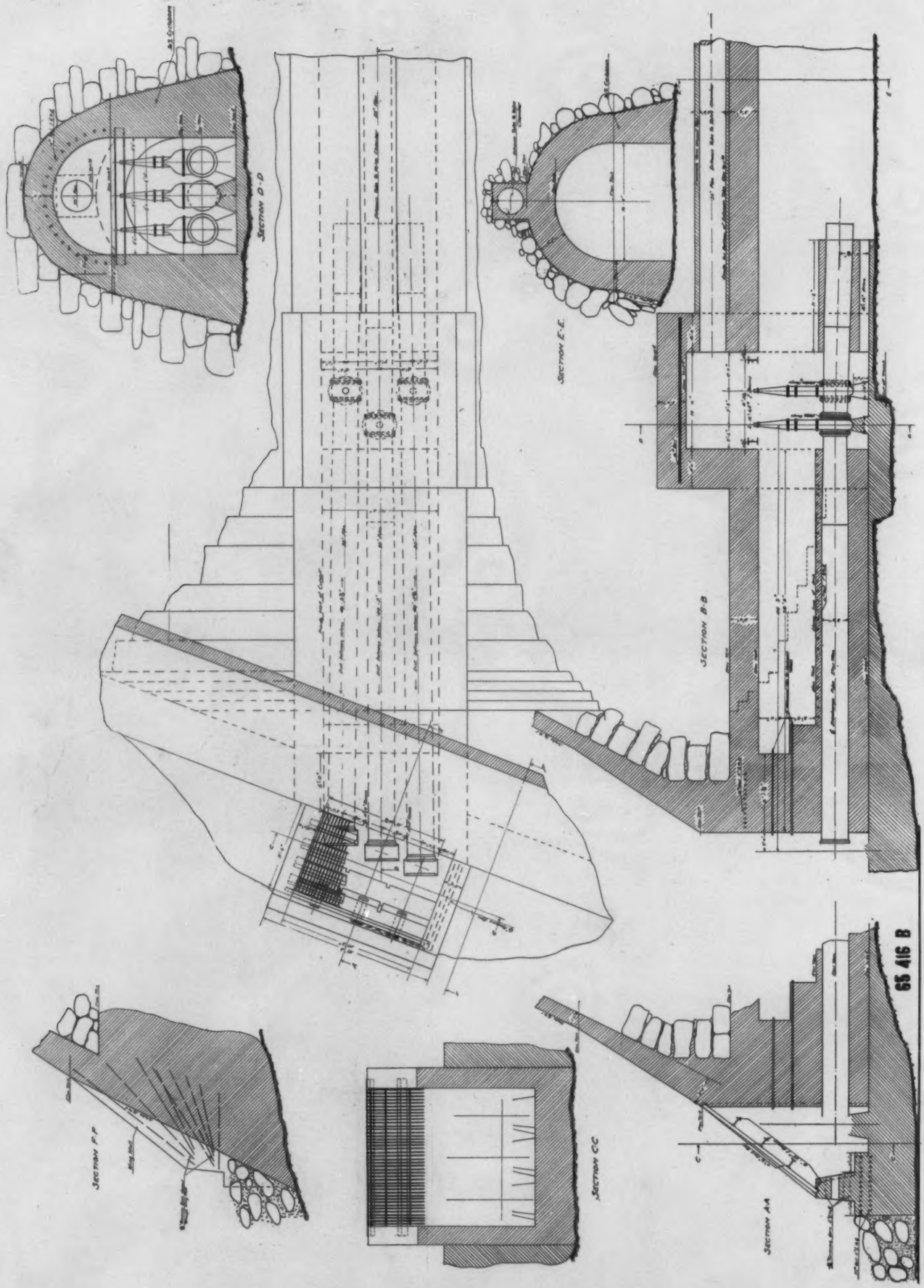


Gravity Lumber Tram.

lands. A sawmill with a capacity of 60,000 board feet per day was built, and from it a railway run twelve miles down the ridge above the flume. At four places, four miles apart, tramways were dropped down the canyon walls to the flume site to supply timber as needed. All the timber was cut and framed at the mill at required sizes so as to minimize work on the flume. The lumber was hauled by two 10-ton and one 20-ton geared Shay locomotive; this type being necessary because of the sharp curves and heavy grades, the maximum curve being 40 degrees and the greatest grade 7 degrees.

The flume is 9 x 6 ft. in cross section and carries water to a depth of 5 ft. 3 in., or 400 cu. ft. per second at a grade of 10 ft. to the mile. In standard practice it is supported by bents spaced with 15-ft. centers, instead of the customary 8-ft. The posts, 8 x 10 in., are set on bearing blocks of pine which rest on cedar footings except where concrete was necessary in some of the rock cuttings. Each bent has two battens and one vertical post, also capped by 8 x 10 in. blocks, the batten posts being gained and the vertical posts flat; 5 x 16 in. lapped stringers and 6 x 8 in. sills are used. The stanchion posts are 5 x 7 in. spaced with 3-ft. centers and tied by 5 x 7 in. timbers. The sway bents and knee braces for the flume sides are 2 x 8 in. timber and the lining planks 1⅞ in. The caps are held to the posts by 16-in. bolts, such interlocking and bolting giving great strength.

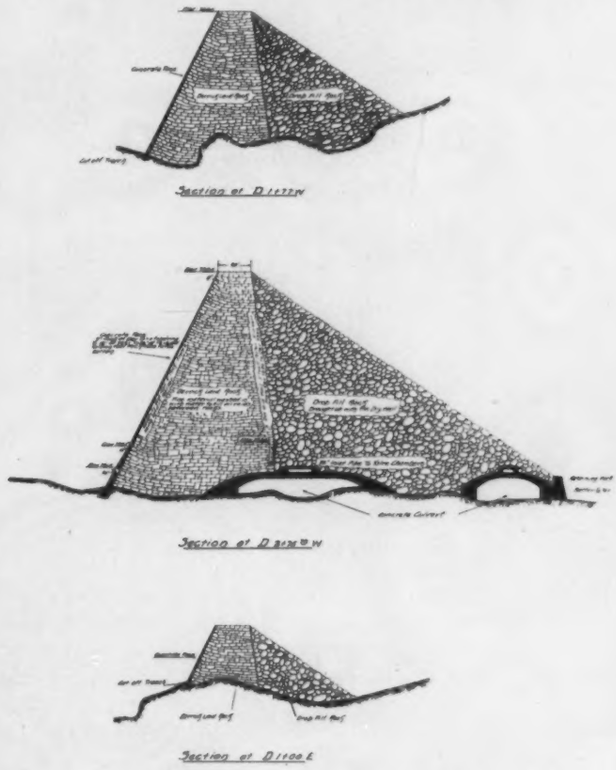
Map of Transmission Line of Stanislaus Electric Power Company, Extensions to Be Made to San Francisco and San Jose.



Plan of Relief Dam.

As already stated the boxing and battens are of sugar pine, all other lumber being of yellow pine. The completed flume contains nearly 18,000,000 board feet. Three of the tramways heretofore mentioned are gravity operated, the other being worked with a steam hoist at the top. As may be seen in the picture of one of these tramways, the loaded car going down pulls the empty cars up, with brake control at the top. Temporary track was laid along the bottom of the flume and the cars run down this to the construction point. After completion light rails were laid on top so that the flume inspector can ride over it.

The 2000-ft. gap between the end of the flume and the forebay reservoir is occupied by a ditch with 12.2-ft. bottom and side slope of ½ to 1. The grade of .83 ft. per 1000 ft. gives a velocity of 3 ft. per second.



Vertical Section of Relief Dam.

Forebay.

The forebay reservoir consists of two small valleys separated by a saddle and stands on a high hill just above the power house. Each of these valleys have been dammed so as to give a maximum depth of 50 ft. in the reservoir and a total available capacity of 14,000,000 cu. ft. of water, enough to operate the plant at full capacity for 15 hours. Most of the saddle was left in place, thus separating the reservoir into two parts; the upper one serving as a settling basin which can be readily cleaned at frequent intervals.

Penstock.

From the forebay the water is carried to the power house by two pipe lines, cross-connected 1300 ft. below the forebay and at the power house header, whence the water is taken to the wheels. Each of these pipe lines consist of two steel pipes 305 ft. long, joined to 1200 ft. of wood stave pipe which is in turn connected with 3000 ft. of riveted steel pipe. The first steel section is 66 in. in diameter and equipped with two 60-ft. stand pipes and wicket valves placed 16 ft. above the junction with the wood stave pipe lines, the latter being of the same inside diameter. The staves are of sugar pine. The spacing of the ⅝-in. bands decrease from 4¼ to 2⅞ in. as the head increases. The wood stave pipe is laid with 2% hydraulic gradient and sustains a maximum head of 102.5 ft.

A header at the terminal of the wood-stave pipes cross-connect them to riveted steel pipes 3000 ft. long, leading to the power house header. The first part of this riveted steel pipe is 48⅞ in. in diameter and 1¼ in. thick, being lap-riveted. This decreases to 40 in. outside diameter and increases to 1 in. thickness at the power house header — the last half requiring butt-strapped joints. All steel pipe was furnished by the Risdon Iron Works of San Francisco. This penstock gives static head from the forebay to the power house of 1495 ft.

Head of Pipe Line Showing Stand Pipes.

The power house is situated in the middle of a great bend in the deep canyon of the Stanislaus River, a sheer 1500 feet below its rocky rim. The site is not far from Angels Camp, already immortalized by Bret Harte in his stories of the early Calaveras miners. At this point water, diverted from the Stanislaus River by dam and led through 15 miles of tortuous canyon by flume, makes a final plunge of 1500 feet, where, after parting with its energy, it is again returned to the river channel.

Water Wheels.

From the power house header two 31-in. pipes are

each branched to three 22-in. pipes, furnishing water to three Pelton units. These wheels are of the Pelton double overhung type, there being two wheels to each unit; one being placed on either side of the generator. Each supply pipe is equipped with 20-in. gate valves provided with gear and worm wheels for hand adjustment and equipped with reversible Pelton motor for automatic operation; 20-in. needle deflecting nozzles direct the water to the buckets. Each wheel unit is controlled by a Pelton oil pressure governor actuating the needle deflecting nozzle.

The water wheel equipment is of the highest grade throughout, with all improvements for security of continuous operation. Each wheel unit has been tested to 15,000 horsepower output. The parts are designed with a very large safety factor, the buckets

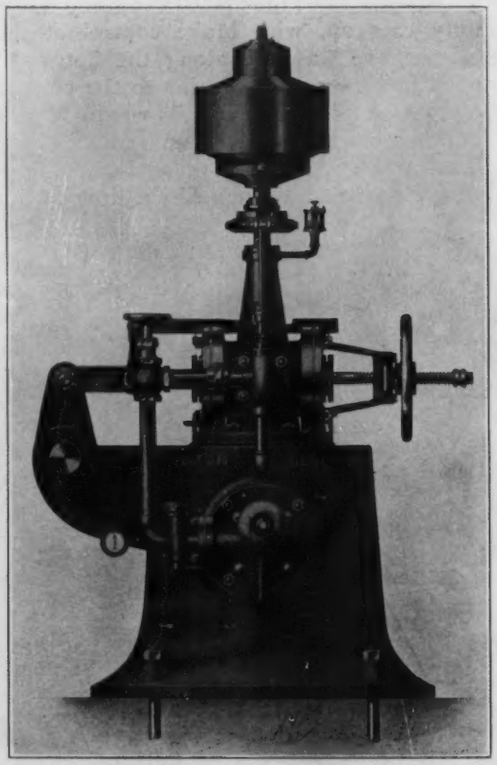
Pipe Line and Power House.

being absolutely secure under operating conditions and also for the maximum size stream under full head, when the wheel is locked in position or when running up to the maximum obtainable velocity. Complete tests have demonstrated the efficiency to be in excess of the manufacturer's guarantees.

The governors are provided with self-contained oil pumps and tanks with synchronizing motors operated from the switchboard and with adjustable relay and returning devices, and have been tested by throwing off the full load of 6700 k. w. and allowing the governor to take care of this extreme condition. The most gratifying results were obtained, the governor keeping the speed under control even during this severe test. The governors are also provided with Pelton patented safety levers, causing the unit to be shut down in the event of accident.

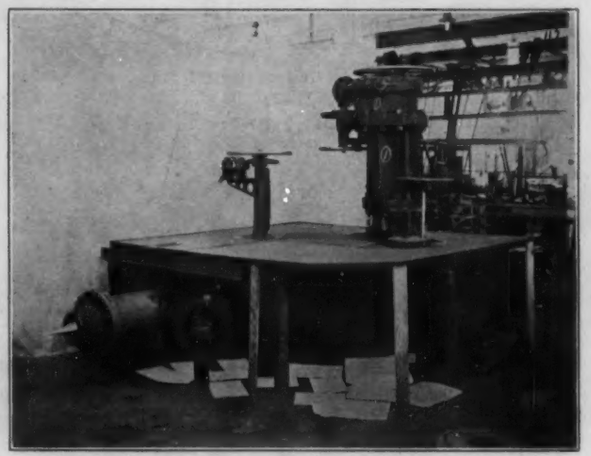
Generators.

The generators are three in number—type A. T. B., 18 pole, 6700 k. w., 4000 volt, General Electric machines, driven at 400 r. p. m. and furnishing three-phase, 60 cycle alternating current, giving a total



Pelton Oil Pressure Governor.

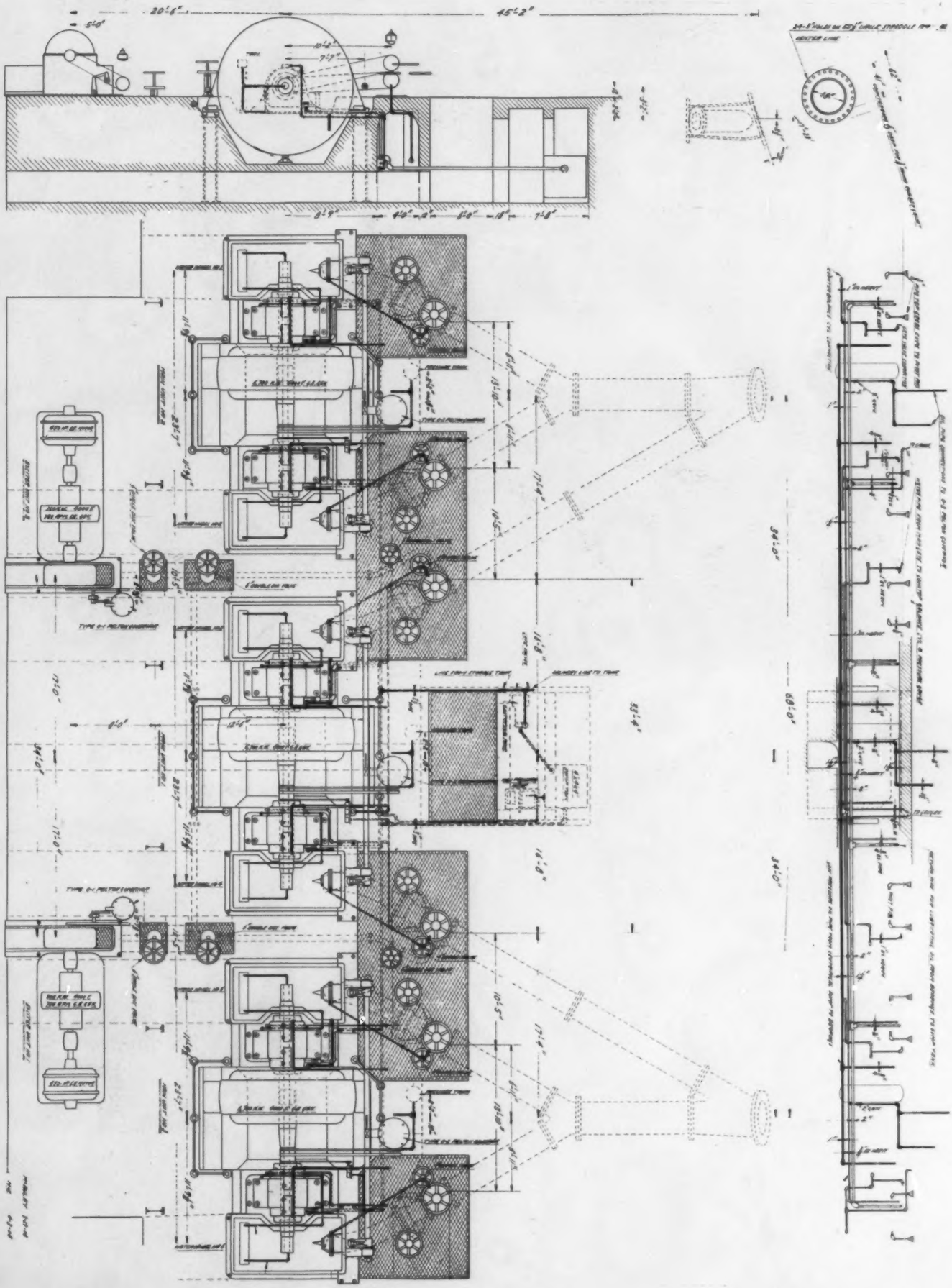
capacity of 20,000 kilowatts. Exciting current is furnished by two water wheel induction motor driven, General Electric dynamos; type M. P., 6 pole, 300 watt, 250 volt, 720 r. p. m. Automatic exciter control has



Arrangement of Nozzle, Gate and Floor Plate.

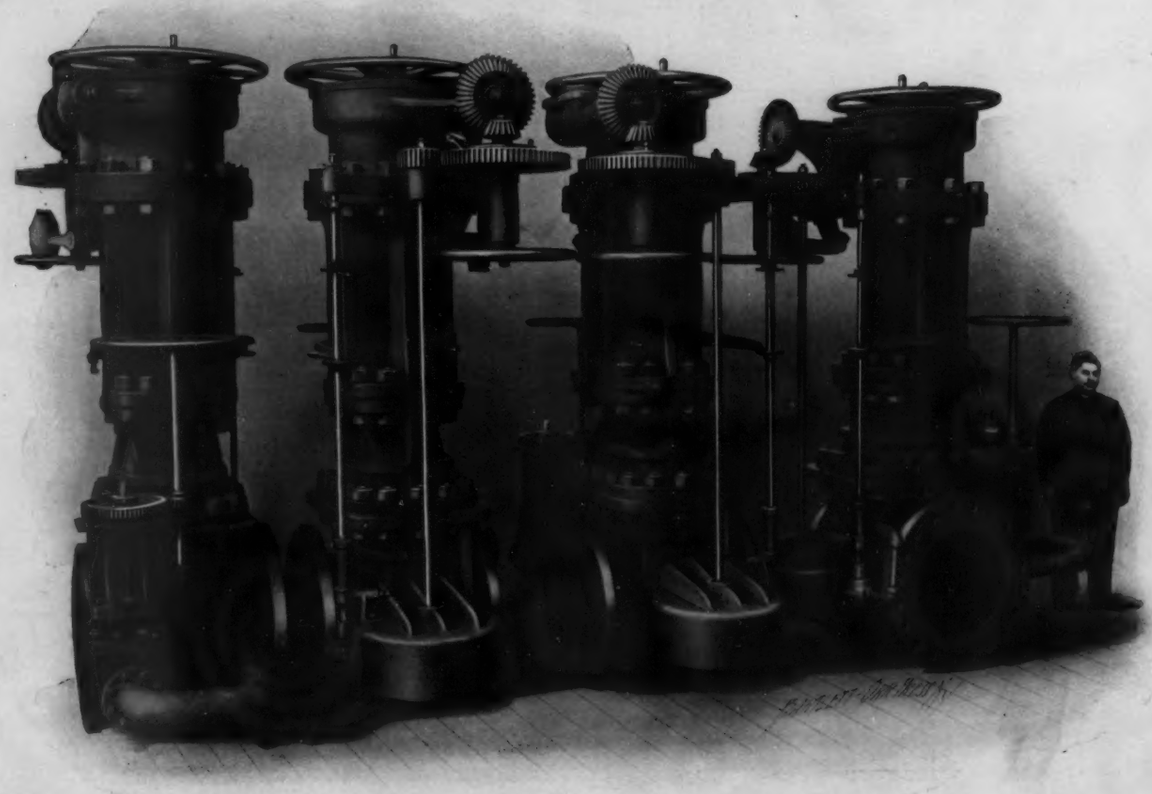
been installed at the main switchboard, which is equipped with General Electric ammeters, voltmeters and control apparatus including Tirrill regulators.

From the switchboard, current is conducted to nine water-cooled 2233 k. w. transformers, raising the voltage from 4000 to 114,000, current to be delivered at the



Plan of Power Plant Interior.

Power Plant Interior During Construction.



20-Inch Pelton Geared Gate Valves.

substation at approximately 100,000 volts. At present, however, until the main substation is completed, current is being supplied at 60,000 volts to the lines of the Pacific Gas and Electric Company. Aluminum cell lightning arresters have been placed on the outgoing lines.

As may be seen from the accompanying map of the transmission line its length is about 150 miles, San Francisco being the terminal. Wires are carried on galvanized steel towers resting on a specially designed steel base and varying in height from 35 to 50 ft. The average span is about 850 ft. The cables are of No. 00 stranded copper wire, six strands to a cable with hemp centers, and are suspended by swinging Locke insulators, each consisting of five elements, each element having been tested electrically to 90,000 volts and mechanically to 5000 lbs. strength, giving it a tested strength of over 300,000 volts. The company is also supplying water to mines near Angels Camp, the bridge, shown in the picture of the power plant, being used to carry the pipe line across Stanislaus River.

From the end of the power house header a pipe is carried across the river and up the opposite side of the canyon to an elevation about sixty feet below the forebay reservoir, where it discharges into a ditch which supplies some mines owned by the power company. This pipe is designed to take water only when there is a surplus not needed at the power house. It works automatically—as the nozzles in the power house are opened the supply of water to wheels increases, thus increasing the friction head in the pressure pipes and reducing the head available to deliver water into the mine ditch. When the wheels are running at full capacity the friction head becomes approximately equal to the difference in head between forebay and mine ditch and the flow through the mine pipe ceases. Independent control by valves is also provided in the mine pipe.

Pelton Wheel

The completed plant embodies the latest practice in hydro-electric construction. It was designed and built under the supervision of Sanderson & Porter, consulting engineers.

CONSERVATION.[1]

BY GIFFORD PINCHOT.

The most valuable citizen of this or any other country is the man who owns the land from which he makes his living. No other man has such a stake in the country. No other man lends such steadiness and stability to our national life. Therefore, no other question concerns us more intimately than the question of homes. Permanent homes for ourselves, our children and our nation—this is the central problem. The policy of national irrigation is of value to the United States in very many ways, but the greatest of all is this, that national irrigation multiplies the men who own the land from which they make their living. The old saying: "Who ever heard of a man shouldering his gun to fight for his boarding house" reflects this great truth, that no man is so ready to defend his country, not only with arms, but with his vote, and his contribution to public opinion as the man with a permanent stake in it, as the man who owns the land from which he makes his living.

Our country began as a nation of farmers. During the periods that gave it its character, when our independence was won and when our union was preserved, we were pre-eminently a nation of farmers. We can not, and we ought not, to continue exclusively, or even chiefly, an agricultural country, because one man can raise food enough for many. But the farmer who owns his land is still the backbone of this nation; and one of the things we want most is more of him.

The man on the farm is valuable to the nation, like any other citizen, just in proportion to his intelligence, character, ability, and patriotism, but unlike the other citizens, also in proportion to his attachment to the soil. That is the principal spring of his steadiness, his sanity, his simplicity, and directness, and many of his other desirable qualities. He is the first of home makers.

The nation that will lead the world will be a nation of homes. The object of the great conservation movement is just this, to make our country a permanent and prosperous home for ourselves and for our children, and for our children's children, and it is a task that is worth the best thought and effort of any and all of us.

To achieve this or any other great result, straight thinking and strong action are necessary, and the straight thinking comes first. To make this country what we need to have it, we must think clearly and directly about our problems, and above all we must understand what the real problems are. The great things are few and simple, but they are too often hidden by false issues, and conventional, unreal, thinking. The easiest way to hide a real issue always has been, and always will be, to replace it with a false one.

The first thing we need in this country, as President Roosevelt so well set forth in that great message which told what he had been trying to do for the American people, is equality of opportunity for every citizen. No man should have less, and no man ought to ask for any more. Equality of opportunity is the real object of our laws and institutions. Our institutions and our laws are not valuable in themselves. They are valuable only because they secure equality of opportunity for happiness and welfare for our citizens An institution or a law is a means, not an end, a means to be used for the public good, to be modified for the public good, and to be interpreted for the public good. One of the great reasons why President Roosevelt's administration was of such enormous value to the plain American was that he understood what St. Paul meant when he said: "The letter killeth, but the spirit giveth life." To follow blindly the letter of the law, or the form of an institution, without intelligent regard both for its spirit and for the public welfare, is nearly as dangerous as to disregard the law altogether. What we need is the use of the law for the public good, and the construction of it for the public welfare.

It goes without saying that the law is supreme and must be obeyed. Our civilization rests on obedience to law. But the law is not absolute. It requires to be construed. Rigid construction of the law works, and must work, in the vast majority of cases, for the benefit of the men who can hire the best lawyers and who have the sources of influence in law making at their command. Strict construction necessarily favors the great interests as against the people, and in the long run can not do otherwise. Wise execution of the law must consider what the law ought to accomplish for the general good. The great oppressive trusts exist because of subservient law makers and adroit legal constructions. Here is the central stronghold of the money power in the everlasting conflict of the few to grab, and the many to keep or win the rights they were born with. Legal technicalities seldom help the people. The people, not the law, should have the benefit of every doubt.

Equality of opportunity, a square deal for every man, the protection of the citizen against the great concentrations of capital, the intelligent use of laws and institutions for the public good, and the conservation of our natural resources, not for the trusts, but for the people; these are real issues and real problems. Upon such things as these the perpetuity of this country as a nation of homes really depends. We are coming to see that the simple things are the things to work for. More than that, we are coming to see that the plain American citizen is the man to work for. The imagination is staggered by the magnitude of the prize for which we work. If we succeed, there will exist upon this continent a sane, strong people, living through the centuries in a land subdued and controlled for the service of the people, its rightful masters, owned by the many and not by the few. If we fail, the great interests, increasing their control of our natural resources, will thereby control the country more and more, and the rights of the people will fade into the privileges of concentrated wealth.

There could be no better illustration of the eager, rapid, unwearied absorption by capital of the rights which belong to all the people than the water power trust, not yet formed, but in rapid process of formation. This statement is true, but not unchallenged. We are met at every turn by the indignant denial of the water power interests. They tell us that there is no community of interest among them, and yet they appear year after year at these congresses by their paid attorneys, asking for your influence to help them remove

[1]Address at National Irrigation Congress, Spokane, August 10, 1908.

the few remaining obstacles to their perpetual and complete absorption of the remaining water powers. They tell us it has no significance that the General Electric interests are acquiring great groups of water powers in various parts of the United States, and dominating the power market in the region of each group. And whoever dominates power, dominates all industry. Have you ever seen a few drops of oil scattered on the water spreading until they formed a continuous film, which put an end at once to all agitation of the surface. The time for us to agitate this question is now, before the separate circles of centralized control spread into the uniform, unbroken, nation wide covering of a single gigantic trust. There will be little chance for mere agitation after that. No man at all familiar with the situation can doubt that the time for effective protest is very short. If we do not use it to protect ourselves now, we may be very sure that the trust will give hereafter small consideration to the welfare of the average citizen when in conflict with its own.

The man who really counts is the plain American citizen. This is the man for whom the Roosevelt policies were created, and his welfare is the end to which the Roosevelt policies lead. As a nation we are fortunate at this time in this fact above all others, that the great man who gave his name to these policies has for his successor another great president, whose administration is most solemnly pledged to the support of them.

I stand for the Roosevelt policies because they set the common good of all of us above the private gain of some of us; because they recognize the livelihood of the small man as more important to the nation than the profit of the big man; because they oppose all useless waste at present at the cost of robbing the future; because they demand the complete, sane and orderly development of all our national resources.

THE IMPOSSIBILITY OF A WATER POWER MONOPOLY.

Extract from Brief by Frank H. Short.

As we have already pointed out, the right to water in California, and in all of the other irrigation states, with which we are familiar, can be acquired only by proceeding with due diligence and without any unnecessary delay after claiming it to appropriate and apply it to a beneficial use, and, if this diligence in appropriation and application is not complied with it is subject to be appropriated by others and when the beneficial use ceases the right ceases.

I have no accurate information, but I assume that there is not at this time generated by water power and applied to beneficial uses in California any power in excess of about three hundred thousand horse power. By surveys, measurements and estimates it has been estimated with approximate accuracy that by the construction of available reservoirs and the expenditure of an amount of money not in excess of a reasonable investment for that purpose that upon one of the mountain streams of California there can be generated not less than five hundred thousand horse power, mostly within the forest reserves. Assuming that the power generated on this one stream would amount to one-tenth of the commercially available horsepower that could be generated in the State by the use of the waters of its natural streams, there could be generated in California alone at least five million horsepower. It is not probable that within the next hundred years the demand for electricity in California will equal its capacity for the production of electric power by water and, therefore, there will be a continuing condition of available waterpowers that under the law cannot be held or monopolized without being beneficially used to their capacity and, therefore, we will not only have electric companies generating more power than is necessary to supply the market, but we will have other available sources of generating power that others can develop if they desire.

If there is any plan or scheme for monopolizing the waterpowers of California or any of the other western states with large rivers and extensive reservoiring capacities, I know nothing of it. Nor do I think any of the parties publishing these rumors know any more about it than I do. I cannot, therefore, confirm or deny the existence of such an attempt, but what I can say is that in my judgment if any such plan or scheme for such a monopoly does exist that it is wholly impossible and chimerical and that fortunately for all of us, while it is to be hoped that the generation and product, sale and distribution will be a desirable and profitable business, it is physically impossible, the naturally greater resources for the production of such power considered, and the unequal demand and probable consumption to create or maintain any such monopoly.

Particularly during the present year there has been an increasing tendency upon the part of the departments of the Federal Government to recognize the impossibility of compliance with some of the terms heretofore proposed by them and a disposition has been evidenced toward the adoption of a more liberal policy in connection with the treatment of this subject notably in the direction of encouraging the reservoiring of water by reducing the charge upon power generated thereby. In view of these indications this brief is written in the hope that it will receive candid and impartial consideration. That if in its statement of principles of law or even as to policies it is sustained by the weight of reason and authority that the suggestions herein made will be adopted and that more especially if certain of the terms proposed to be exacted by the departments of the Federal Government are illegal and in contravention of constitutional principles and state laws that any such position and contention will be receded from and that "to the respective states will be left the matters that pertain to the state," the imposition of taxes, the regulation of monopolies and the conditions under which these rights shall be exercised and enjoyed, leaving only to the Government of the United States the protection of the public domain and the regulation and control of conditions thereon so that no injury will result thereto and so that the government will obtain a fair consideration for any detriment done to its lands or its properties such as could be exacted or obtained by a private owner, but that as to the regulating monopolies, fixing terms and imposing taxes that it will be recognized and those are functions of the state, and, again borrowing the language of President Roosevelt, such being "matters that relate only to the people within the State, of course the state is to be sovereign and should have the power to act."

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Military Engineering

Any great engineering project is cognate to an army maneuver in that organization and discipline are essential to success. Too often this fact is disregarded and after the most careful plans have been prepared in the engineer's office, the field work is performed by others in a careless and haphazard manner. Many a campaign, carefully planned in advance, is upset by some unforeseen circumstance, trivial in itself, but disastrous to the plan. An engineer is liable to devote much attention to design and then neglect the correlative of construction. In field work the unexpected is always happening; to meet such contingencies requires not only a resourceful executive, but also an organization trained to do his bidding.

An excellent example of what has been accomplished by applying army methods to engineering is afforded in the study of the construction of the great system of the Stanislaus Electric Power Company described in this issue. Embodying, as it does, all the latest features of a modern hydro-electric plant, there were many difficult problems for the engineer to solve. Plans were carefully prepared and in 1902 field work was started. Yet it dragged, until in 1906 comparatively little headway had been made. There were many good excuses for this. Construction was carried on simultaneously along a great stretch of rough country seventy-five miles in length. All the titanic forces of Nature seemed to conspire to prevent the taming of this wild Sierrian stream to man's use. In addition to the great natural obstacles of a primeval country through which trails had to be cut and roads built before material could be delivered, the very elements were unfavorable. Snow and ice blocked winter work, freshets carried out spring construction and forest fires destroyed the results of the summer's endeavor. Labor trouble and sickness added their quota. Non-delivery of supplies still further complicated matters.

Such was the chaotic state of affairs when Mr. R. S. Buck took charge, bringing with him experience which he gained with the United States Army engineers. He soon established a military procedure that quickly carried work to completion. The first task was to establish a good commissary, for a construction gang, even more than an army, "moves on its stomach." Likewise, a medical corps was put into the field. By adopting the best methods and abolishing some of the red tape, an efficient organization was soon installed, and order took the place of chaos.

This example is cited merely to show that the old division of engineering into military and civil sections should be nominal only, for the civil engineer has much to learn from military field methods. Few engineering students realize what a value their military training may be for them in after life.

CURRENT COMMENT

The going value is in expression used in estimating the value of a public utility wherein the cost of reproducing a given income is the basis of valuation.

A free telephone information bureau has been established by the New York American to answer any questions as to the news of the day, all without charge.

Electric furnace pig iron produced at the Heroult plant of the Noble Electric Steel Co. on the Pitt River in Shasta County, California, is now in the local market in carload lots.

Telephones at Pekin, China, are to be installed by the Western Electric Co. under order from the Chinese Government. This will be the first common battery system to be installed in the empire.

Pacific Gas & Electric Co. will occupy its new office building on Sutter between Stockton and Powell Streets, San Francisco, on August 23, 1909, giving up temporary quarters occupied at 925 Franklin street.

The Mont Blanc electric railway in Switzerland is now in operation to an elevation of 5495 feet, whence it will be continued to the summit, the last stage being negotiated by an adit tunnel and electric elevator.

Electro-metallic parabolic reflectors are now being made for locomotive headlights. By depositing silver and gold in alternate bands the light can be given great penetrating power combined with an intense dazzling effect.

Cutting fire trails with Angora goats is being tried on the Lassen National Forest Reserve in California. The goats destroy the brush while grazing, covering more ground at less cost than can be accomplished by grubbing.

The South power house of the Northern California Power Co. near Manton, California, furnishing 5000 h. p., was started on August 17th, being tied in with the other plants and the transmission lines of the Pacific Gas & Electric Co.

A new Atlantic cable has been laid by the Commercial Cable Companies between New York and New Foundland, joining the main trans-Atlantic cable 270 miles east of St. John. It is expected that the speed of transmission will be increased by the new line.

Electrolytic copper wire is being made by electrolytic disposition on revolving mandrels scored with V-shaped spiral scratches. These mandrels are revolved in the electrolyte until the desired thickness of copper is deposited, when the metal is unwound in long strips readily finished into homogeneous wire of great tensile strength. According to the inventor, Mr. Sherard Cowper-Coles of England, these strips may be made four miles in length.

Electrolytic brass has been experimentally made by Mr. S. Field according to a paper recently read before the Faraday Society. Electrolysis of a solution of the double cyanides of copper and of zinc causes a deposition of these metals on the anode. According to the chemical equations of the reactions the same current will deposit about twice as much copper as zinc, which is a good proposition for brass. Constant stirring of the solution is necessary. The possibilities of making alloys by electro deposition are interesting.

A transcontinental telephone circuit was recently closed so that telegraph messages were sent between San Francisco and New York. With the completion of the long-distance lines between Kansas City and Denver, the Colorado Telephone Company can reach Chicago and Eastern points. Long distance telephone service between Denver and Salt Lake City has been available for some time. Local circuits through the Northwest complete the wire connection to the Pacific Coast. While possible to transmit the Morse code this circuit is far too long for speech transmission at present.

The Railroad and Power Co. of Maine has been organized as a holding company for the Stanislaus Power & Development Co. and the San Francisco Electric Railway, the stock being held by the United Railroads Investment Co. The Stanislaus Power & Development Co. is to acquire the Stanislaus Electric Power Co. and the Tuolumne Water Power Co. under a plan of reorganization which provides for the issuance of a first mortgage on the property to furnish funds for the acquisition and completion of the plant and transmission lines, and also an issue of $6,000,000 second mortgage 5 per cent bonds to be exchanged for the $6,000,000 first mortgage bonds of the Stanislaus Electric Power Co.

Petroleum production in 1908 according to the United States Geological Survey show that the total production aggregated 179,572,479 barrels, valued at $129,706,258, an increase in quantity of 8.11 per cent over 1907. Oklahoma led all the States in production, with a total of 45,798,765 barrels, an increase of 5.23 per cent over 1907; California was a close second, with 44,854,737 barrels, an increase of 22.85 per cent aver 1907; but Illinois gained the greatest percentage, rising from 24,281,973 barrels in 1907 to 33,685,106 barrels in 1908. a gain of 38.72. Colorado, Louisiana, Michigan, Missouri, Utah, Wyoming, and West Virginia also showed gains in production. The declines were in Indiana, where it was nearly 36 per cent; in Kansas, 25; Ohio, 11; Texas, 9; Pennsylvania, nearly 6; New York, 4.3; and Kentucky and Tennessee, 11 per cent. The average price of petroleum for the entire country in 1908 remained identical with that of 1907, but there were considerable variations of an important character in individual States. The most notable of these was the increase in price in California, from 37c per barrel in 1907 to 52¼c in 1908. The Gulf States, Louisiana and Texas showed a decline in value from a little over 80c to 60c. The Appalachian oil showed a slight increase in value, from $1.75 in 1907 to $1.79 in 1908. On the whole, prices were remarkably steady, considering the notable increase over the large production of 1907.

JOURNAL PORTRAITS

D. E. Harris, sales manager of the San Francisco office of the newly incorporated Pacific States Electric Company, which has taken over the business of the Sterling Electric Company of San Francisco, the Pacific Electrical Works of Los Angeles and the Crescent Electric Company of Oakland, is one of the best known of San Francisco's electric supply men. He was born in the Yosemite Valley, Mariposa County, his father being in charge of the Valley stage line at that time.

Mr. Harris came to San Francisco in 1895, when eighteen years of age, and after a years' course in the business college, was employed by John M. Klein Electrical Works, one of

D. E. Harris.

the oldest electrical concerns on the Coast. He entered their employ as an errand boy. After several years of hard and close application to his work, soon become so familiar with the electrical industry that he was given a position on the floor. In 1903, when John Klein took a years' vacation to Europe, he placed Mr. Harris in the position of sub-manager during his absence. Later, he was placed in charge of the sales department. In 1906 he occupied a similar position with the Century Klein Electrical Company, with headquarters in Oakland, and when the business was enlarged, under the name of Sterling Electrical Company, he was placed in the same capacity. Probably no one connected with the buying and selling branch of the electrical industry of San Francisco or around the bay towns is better known. Mr. Harris is old in this experience, as he has been continuously connected with the supply business for over thirteen years, and during that time, has received orders from some of the largest installations on the Coast.

S. J. McMeen of McMeen & Miller has been elected a member of the executive committee of the San Francisco Section, A. I. E. E., vice H. W. Clapp, resigned.

PERSONALS.

J. F. Byxbee has been appointed city engineer for Palo Alto, Cal.

R. J. Cash Jr. of the Portland office of the General Electric Company, was in San Francisco last week.

C. L. Wernicke, manager of the Portland office of Westinghouse Electric & Manufacturing Company, is in San Francisco.

Dr. C. R. Ray, president and general manager of the Rogue River Electric Company, was in San Francisco last week.

W. A. Bissel, president of the Livermore Water & Power Company, Livermore, California, was a recent visitor in San Francisco.

J. J. Brown has been elected vice-president and general manager of the Wheeler Condenser & Engineering Company, Cartaret, N. J.

Alonzo Gartley of the Hawaiian Electric Company, has returned to Honolulu after a four months' tour throughout the United States.

George Moffat, consulting engineer, New York City, is now at Vancouver as consulting engineer for the British Columbia Electric Railroad.

C. M. Fitzgerald has retired as general manager of the Loon Lake Power Company at Georgetown, Cal., being succeeded by Herman D. Jerrett.

H. L. Jackman, general manager of the Humboldt Gas & Electric Company, has returned to Eureka, California, after a brief visit to San Francisco.

R. F. Monzes, formerly assistant engineer with the San Francisco office of the General Electric Co., has been appointed engineer of their Portland, Oregon, office.

E. P. Smith, representing New York stockholders of the Oregon Electric Railway, recently made an inspection of the road in view of proposed improvements and extensions.

Murray Orrick, manager of the Oakland, Cal., branch of the Western Electric Company, has succeeded B. C. Holst, resigned, as manager of the telephone sales department.

E. A. Crowson, formerly outside salesman for the Western Electric Company, is now manager of the Oakland branch of the Western Electric Company, succeeding Murray Orrick.

S. L. Nickolson, newly appointed sales manager of the Westinghouse Electric & Manufacturing Company, passed through San Francisco last week on a visit of inspection. He is now in Seattle.

R. B. Guernsey, formerly with Harron, Richard & McCone, has opened offices in the Monadnock Building, San Francisco, as representative of the American Blower Company and of the Harrison Safety Boiler Works.

E. T. Tannatt, formerly professor of electrical engineering at the University of Montana, is now superintending the construction of the power plant of the North Idaho Power Company on the lower Priest river.

Mr. Hugo Reisinger was honored at Berlin on August 9 by Emperor William, who conferred the Crown Order of the Second Class on him, in recognition of services in helping to organize the splendid exhibit of modern German art at the Metropolitan Museum of Art last January.

H. B. Heryford has resigned as local manager of the Colusa Gas & Electric Company, Colusa, Cal., to accept the position as manager of the Chico Gas & Electric Company, Chico, Cal. William H. Henderson of Sacramento, Cal., has succeeded Mr. Heryford as local manager of the Colusa Gas & Electric Company.

NEWS OF THE STATIONARY ENGINEERS.

PREAMBLE.—This Association shall at no time be used for the furtherance of strikes, or for the purpose of interfering in any way between its members and their employers in regard to wages; recognizing the identity of interests between employer and employe, and not countenancing any project or enterprise that will interfere with perfect harmony between them.

Neither shall it be used for political or religious purposes. Its meetings shall be devoted to the business of the Association, and at all times preference shall be given to the education of engineers, and to securing the enactment of engineers' license laws in order to prevent the destruction of life and property in the generation and transmission of steam as a motive power.

California.

No. 1. San Francisco. Thursday, Central Hall, 124 Fulton St. Pres., A. C. Arbuckle. Sec., Herman Noethig, 900 York St.
No. 2. Los Angeles. Friday, Eagles' Hall, 116½ E. Third St. Pres., Gabriel Allen. Fin. Sec., Harry Notthoff, 1307 Winfield St. Cor. Sec., W. T. W. Curl, 4103 Dalton Ave.
No. 3. San Francisco. Wednesday, Merchants' Exchange Bldg. Sec., David Thomas, 914 O'Farrell St.
No. 5. Santa Barbara. Geo. W. Stevens, 2417 Fletcher Ave., R. R. No. 2.
No. 6. San Jose. Wednesday. Pres., W. S. Pierson. Sec., Leal Davis, 350 N. 9th St.
No. 7. Fresno. Pres., J. F. Wagoner. Sec., F. J. Whitney, Box 8.
No. 8. Stockton. Thursday, Masonic Hall. Sec., S. Bunch, 626 E. Channel St. Pres., Jos. Gieger.

Oregon.

No. 1. Portland. Wednesday, J. D. Asher, Portland Hotel. Pres., O. H. Reed.
No. 2. Salem. A. L. Brown, Box 166.

Washington.

No. 2. Tacoma. Friday, 913½ Tacoma Ave. Pres., Geo. E. Bowman. Sec., Thos. L. Keeley, 3727 Ferdinand St., N., Whitworth Sta.
No. 3. Walla Walla. 1st and 3d Wednesday, German Hall. Pres., W. M. Quinn. Sec., O. L. Compton, Box 11.
No. 4. Spokane. Tuesday. Pres., Grant Tuttle. Sec., J. Thos. Greeley, 0601½ Cincinnati St.
No. 6. Seattle. Saturday, 1420 2d Ave. Pres., J. H. Beckman. Sec., J. C. Miller, 1600 Yesler Way.

Practical letters from engineers and news items of general interest are always welcome. Write your items regardless of style. Communications should be addressed to the Steam Engineering Editor.

CALIFORNIA NO. 3.

Mr. Herrmann Schussler, consulting engineer of the Spring Valley Water Company, delivered an interesting lecture on the water company's system Wednesday evening, August 11th, before an appreciative audience of 135 members and friends of California No. 3 and No. 1, N. A. S. E., at the assembly rooms of the Merchants' Exchange Building.

Mr. Schussler gave a short history of the company and outlined its progress since 1864, the year in which he began his labors with the company. Large maps, charts and stereopticon slides, graphically assisted Mr. Schussler to convey to the listeners the magnitude of the company's works. The description of the Sunol filter beds, the enormous tunnel system and the flexible pipe line across the bay, was exceptionally interesting, the views of the present dams, all of which were uninjured by the late earthquake and the sites of future projected dams in the Alameda County valleys, were a revelation to the audience, as it was shown that by erecting suitable barriers the water supply of San Francisco can be increased several times over what it at present consumes.

As President Arbuckle, San Francisco No. 1, is taking an extended vacation in the Hawaiian Islands, for his health, it was necessary, at the last regular meeting to re-adjust the offices as follows: Vice-President Ennor was elected President; John T. Stewart was elected Vice-President.

SAN FRANCISCO SECTION A. I. E. E.

George R. Murphy, engineer with the Electric Storage Battery Company, has been elected chairman of the San Francisco Section of the American Institute of Electrical Engineers. C. W. Burkett, chief engineer of the Pacific T. & T. Company, vice-chairman, and S. J. Lisberger, electrical engineer of distribution for the Pacific Gas and Electric Company, secretary.

CONVENTION OF THE NORTHWEST ELECTRIC POWER ASSOCIATION.

The Northwest Electric Light and Power Association convenes at the Yukon-Alaska Exposition at Seattle on Septemper 7, 8 and 9. It is yet too early to give a brief program, but the following outline will be closely followed:

FIRST DAY.

Address by Governor Hay of Washington.
Responses in behalf of A. I. E. E. and Northwest Electric Light & Power Association.
Papers on Transmission, High Efficiency Lamps and Illuminating Engineering.

SECOND DAY.

Report of Committee on Rates read by Mr. Osborne of the Washington Water Power Company of Spokane, Wash.
Method of Handling Complaints, by Mr. Whittaker of the Seattle-Tacoma Power Company.
Paper on Electrical Appliances and Their Influence on Load Factor.
Paper on Electric Vehicles and Their Influence on Load Factor.
Report of Committee on Uniform Accounting.

Afternoon.

Executive Session.
Election of Officers.
Reports and Executive Business.

THIRD DAY.

Papers to be discussed in Executive Session.

In addition to the program there will be a reception in the Washington State Building upon the evening of the first day. In the afternoon of each day the sightseeing car of the Seattle Electric Company will be placed at the disposal of the ladies attending with the delegates. In the afternoon of the second day a boat trip around Lake Washington is planned for the ladies. In the afternoon of the last day a steamer will be chartered for a trip around Bainbridge Island for all delegates and their guests. In the evening of the last day will be the regular banquet, for which some special and very interesting features are planned.

Special invitations have been extended to all the California central station men and to members of the Pacific Coast Electric Vehicle Association to attend the Convention.

A GOOD POINT, WELL TAKEN, HOT OR COLD—LETTER TO A HOT POINT SALESMAN.

Ontario, July 24, 1909.

Dear Mr. Smith: Stay right on the plan you have been working on. You are to sell Hot Point Irons on their merits always.

The factory sends you into your territory to call on the trade and demonstrate the iron, simply because we cannot ask the trade to come to the factory. Please remember that you are part and parcel of the home organization. As far as your customers are concerned you are the factory.

You are in one town today and in another tomorrow, carrying as much of the spirit of this organization with you as possible.

Forget that your name is Smith.

Forget your own personality.

Forget this slap-'em-on-the-back style of salesmanship.

Forget trying to be a "good fellow."

Not that we think this is your method. Your reports indicate exactly the opposite. But we want to explain once more that all this sort of thing is no part of our selling plan.

THE SALES MANAGER.

The Roessler & Hasslacher Chemical Company, 100 William street, New York, has installed in its works at Perth Amboy, N. J., a 300 horsepower Westinghouse horizontal gas engine operating on producer gas derived from anthracite coal. The generator furnishes three-phase 60 cycle alternating current at 480 volts, to be used for power and lighting services about the plant.

TRADE NOTES.

Mr. Jay F. Hoover, who has been manager of the Cleveland office of the Nernst Lamp Company for the past five years, has been appointed special agent of the of the company, with headquarters in Pittsburg. The Cleveland office is now in charge of Mr. J. B. Mitchell.

Among recent sales of heavy electrical machinery made by Allis-Chalmers Company is a contract covering two three-phase 25 cycle, 6600 volt, alternating current generators, with a combined capacity of 8000 k. w., to be direct-coupled to gas engines in the power plant of the Carnegie Steel Company's Carrie Furnaces at Rankin, Pa. These are the largest machines ever built for services of this character.

At the Bernon mills of the Manville Company, Georgiaville, R. I., a 300-kilowatt Westinghouse low-pressure turbine is being installed to take steam at atmospheric pressure from the exhaust of a Corliss engine, driving a three-phase, 60-cycle, 600-volt alternator to supply additional power and lighting for the mills. The turbine is operated without superheating and exhausts into a condenser maintaining a vacuum of 27 inches. Besides the lighting service for the mills, the distribution system supplies a synchronous motor direct-connected to mill line shaft.

In order to meet the imperative requirements for space resulting from the merging of The American Trust & Savings Bank and the Continental National Bank, H. M.Byllesby & Company will vacate the fifth floor of the American Trust Building, on Sunday, August 1st, to enable the merged banks to occupy this space to accommodate a part of their clerical force, and H. M. Byllesby & Company will on that date open temporary offices in the banking rooms at the corner of Dearborn and Monroe streets, formerly occupied by the Commercial National Bank. On October 1st, H. M. Byllesby & Company will move to the banking rooms at present occupied by the Continental National Bank, and will remain in that location until they return to the American Trust Building on June 1st, 1910.

A single boiler of unusual capacity, 2274 horsepower, has been placed in the Delray power station of the Detroit Edison Company. This boiler, a Stirling Special, has a 150-inch by 11-foot grate, and is served with bituminous coal by four Roney stokers installed underneath the one boiler. This exceptional installation is in the first section of the Detroit Edison Company's No. 2 power house at Delray, and in the construction of the plant allowance has been made for extending the outfit with similar units as the station's lighting load increases. George W. Cate is superintendent of the plant. The engineering design and construction was carried out by Westinghouse, Church, Kerr & Company.

Contracts were placed during the past week for the material required for the construction of the eight-inch pipe line of the Union Oil Company which will reach from Colgate, California, to the Pacific Coast, a distance of 260 miles. Of the contracts placed, Fairbanks-Morse & Company, San Francisco, secured the Direct Acting Compound and Simple Duplex pumps; Charles C. Moore & Company, San Francisco, the Snow pumps of the crank and flywheel type; the Risdon Iron Works, San Francisco, Heine boilers, and Gilhuly & Ambler of San Francisco, 170 miles of steel line pipe; order for the balance of the pipe, 70 miles, was placed with the La Belle Iron Works, Steubenville, O. Gilhuly & Ambler represent the Youngstown Sheet and Tube Company of Youngstown, O. The order for pipe placed with them will cover approximately 700 cars, and is the largest order for pipe ever placed on the Pacific Coast. The installation of this pipe line will also include a complete telephone system, equipment for which will be purchased later.

NEW CATALOGUES.

The California State Board of Trade have now ready for distribution their nineteenth annual report entitled "California Resources and Possibilities." It is very complete, covering details regarding the products of California which should prove of great interest and value.

The American Society of Engineering Contractors have issued Volume 1 of their journal containing constitution and list of members, which already includes over 1500 contracting engineers. This Society owes its inception to Mr. Halbert P. Gillette, managing editor of Engineering-Contracting, and has had a remarkable growth since its permanent organization, April 14, 1909.

The Dodge Manufacturing Company of Mishawaka, Indiana, send a handsomely illustrated volume entitled "Twenty-five years of Rope Driving," intended primarily to show the advantages of the Dodge American System of Rope Transmission. It contains much technical information of value to any engineer interested in this sort of work, as it includes typical illustrations for all classes of service.

The American Transformer Company of Newark, N. J., is distributing a pamphlet describing the American Tungsten Lamp Transformer. The recent practice of using Tungsten Lamps on voltages lower than commercial voltages has created a demand for a small step down transformer of this character and the pamphlet in question includes with other data reference to some of the good points which specially adapts the American Transformer to this class of work.

The Wesco Supply Company, whose main office and warehouse is located at St. Louis, Mo., and branch warehouses at Birmingham, Ala., Ft. Worth, Texas, has published an interesting series of nine bulletins on machinery in which full information is contained on alternating and direct current motors and generators, switchboards, switchboard instruments, exhaust fans, electric pumps and Wesco transformers. Any one or the entire set of these bulletins will be sent to readers upon request.

Edge Moor Iron Company have issued a new edition of their Boiler Catalogue, which is one of the most handsomely printed and substantially bound volumns we have received. While a large part of it is a reprint of previous editions, it contains considerable new data with regard to the re-inforced screwed pipe connection. In addition to the views of their excellent equipment for making boilers it contains considerable technical data on boilers, supplemented by a great number of detailed drawings.

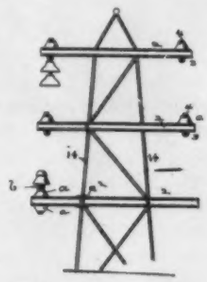
Allis-Chalmers Company are distributing bulletin No. 1519 describing the Tomlinson Barometric Condenser Type "AN," which they claim is the most simple and efficient apparatus of this type which has thus far been developed. With the advent of the steam turbine and the demand for higher economies, the importance of the condensing apparatus has become more clearly apparent, and it now holds its rightful place, as one of the principal parts of the steam plant. Copies of the bulletin may be obtained on application to the company.

The American Electrical Heater Company, Detroit, Mich., has issued Catalogue 25 on 'American Electric Heating Devices." These devices include air heaters, annealers, baking ovens, bar urns, branders, bust formers, chafing dishes, cigar branders, coffee pots, cooking ovens, cork branders, curling-iron heaters, disk stoves, foot warmers, glue pots griddles, hair driers, hot plates, hot-water urns, instruments, sterilizers, irons for all purposes, percolators, plate warmers, radiators, soldering irons, solder pots, sweating blankets, teakettles, warming pads, water heaters, wood benders, and many other electric accessories.

PATENTS

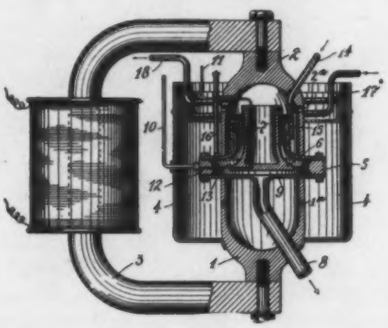
929,773. Current-Leak Indicator for Electrical Conductors. Raymond S. Masson, Berkeley, Cal.

A leak-indicator for electrical lines composed of a non-conducting material having a surface exposed to view that is adapted to become visibly changed in appearance under the



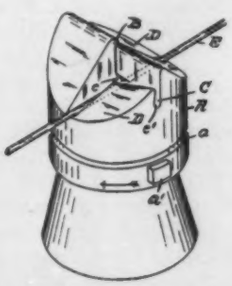
action of the electrical current thereon,—said indicator being interposed between the line-carrying insulator and the ground, whereby a leakage of current through the line-insulator to the ground will come in contact with the indicator.

930,212. Apparatus for Treating Gases by Electricity. Ignacy Moscicki, Fribourg - Gambach, Switzerland. In an electric furnace for the treatment of gases, the combination with a furnace chamber, and means for supplying untreated gases to and removing treated gases from said furnace



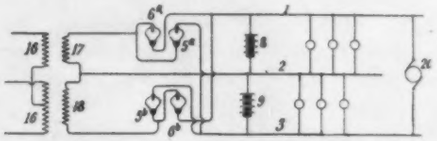
chamber, whereby there is caused a flow of gas through said chamber, of an annular electrode through which the gases flow, another electrode terminating with a free end which is within arching distance of the annular electrode, said free end facing in the direction toward which the gases flow, and means for causing an angular movement of the arc.

929,878. Insulator. Joseph W. Ranson, Batavia, Ohio. An insulator comprising a shiftable body provided with means



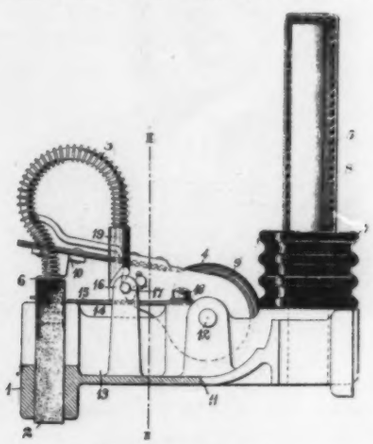
for receiving the wire when in one position and means for bending and automatically interlocking with the wire when shifted to a different position.

930,325. System of Distributing Electrical Energy. Percy H. Thomas, Pittsburg, Pa., assignor to Cooper Hewitt Electric Company. In a system of electrical distribution, the combination with three-phase mains and means for deriving therefrom independent two-phase sources, of a three-wire work circuit connected to two of the terminals of the said independent sources, the neutral wire of the receiving circuit being connected to the two other terminals of these sources



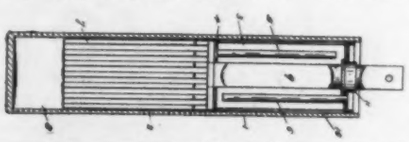
and vapor electric devices connected between each of the outside direct current mains and each of the first named two-phase terminals so directed as to pass current through the work circuit in one direction only, together with storage batteries between the receiving circuit mains and the neutral wire whereby energy from either of the independent two-phase sources impresses a constant potential upon one only of the sides of the three-wire receiving circuit.

930,068. Brush-Holder for Dynamo-Electric Machines. Frank W. Garrett, Pittsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company. In a current-collecting device, the combination with a brush, a holder, and a flexible



conductor one end of which is attached to the brush, of a detachable connection between the flexible conductor and the holder comprising a cam hook attached to the free end of the conductor, a loop on said holder, and means for holding the hook in engagement with the loop.

930,065. Electric Storage Battery. Bruce Ford, Philadelphia, Pa. An invertible battery jar subdivided into intercommunicating superposed overflow and plate compartments and provided with oppositely arranged vent tubes communicating



with the overflow compartment and respectively with the plate compartment and with the outside of the jar and whereof the latter extends into the overflow compartment beyond the possible level of liquid therein when the jar is inverted.

INDUSTRIAL

THE REGENERATIVE FLAME LAMP.

The regenerative flame lamp is an arc light whose great success abroad attests for its efficiency and justifies the claims for superiority advanced by the Adams-Bagnall Electric Company of Cleveland, Ohio, represented in San Francisco by the Electric Appliance Company.

While this lamp produces the characteristic orange ray of the ordinary flame arc, with an even greater intrinsic brilliancy, it can hardly be considered in any other sense of the word a lamp of this type. The carbons are placed vertically, one above the other, and enclosed with double globes, inner globe being clear and the outer opalescent. The inner globe cap or top contains an opening, communicating with two side tubes, which allows a free circulation of the gases in the globe, permitting them to return to the bottom of same, also open and on becoming re-heated by the arc repeat the cycle of operations. The chemicals in gaseous form are thereby used over again, intensifying the light and thus giving rise to the name Regenerative. Both inner and outer globes are tightly sealed both top and bottom to prevent ingress of air.

The design of the lamp is such as to entirely eliminate all shadows, an inherent objection in many forms of arc lamps.

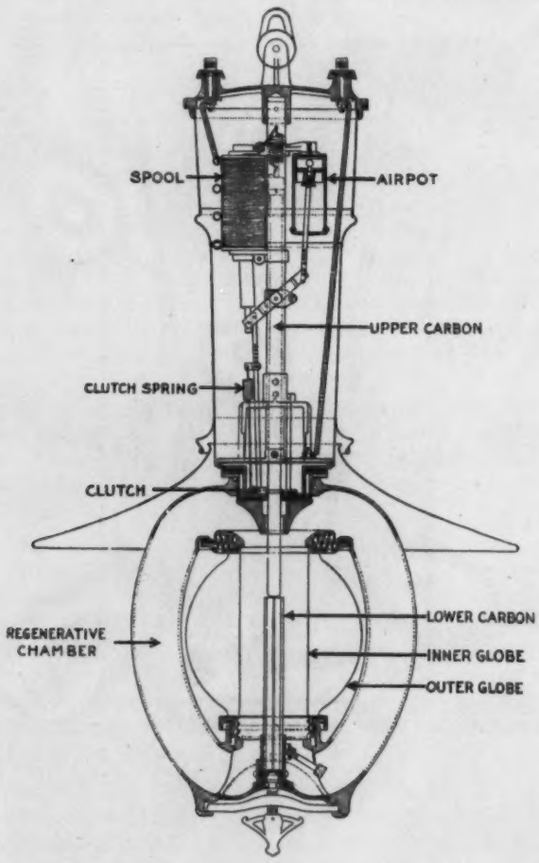
The lamp case is rugged and absolutely weather-proof. Length over all is thirty-six inches, and weight complete including globes and reflector, forty pounds.

The reflector is twenty-four inches in diameter, being made of No. 22 gauge sheet steel and heavily enameled, both top and bottom.

The lamp mechanism is extremely simple and very accessible, insuring a minimum cost for repairs and ready inspection of internal parts.

One of the remarkable features of the Regenerative Lamp is the long life of carbons. Exhaustive tests show an average life of seventy hours; a comparison with the ordinary flame arc, having a maximum carbon life of fourteen to sixteen hours, makes its economic advantages obvious and its adoption possible under many conditions where a high luminous intensity is desired, that would not permit the use of a flame lamp that required daily trimming.

The perfection of these carbons is the result of exhaustive research work to discover the proper elements that would give the desired results.



The maximum candlepower of the Regenerative Lamp is 3400 at an angle of 40 degrees from the horizontal and a mean lower spherical candle power of 2200 with a consumption of 550 watts. The diffusion is excellent.

The standard current consumption is five amperes and they can be furnished for operation either in multiple on 100 to 120 volts, multiple series, two on 220 to 250 volts, or five on 550 volts, for either direct or alternating current.

The inner globe and carbons are removed together, by one turn of a screw. Only one pair of carbons are used, and there are no rods or moving parts to clean. The outer globe remains in position, never requiring removal, which reduces the chance for breakage to a minimum. Neither is it necessary to lower the case for trimming.

WESTINGHOUSE TYPE GA CONDENSER-LEAD CIRCUIT BREAKER.

The recent revival of several large power developments which had been held up for financial reasons, and the rapid extension of existing systems, have led the Westinghouse Electric and Manufacturing Company to develop and place on the market a heavy-capacity oil circuit breaker.

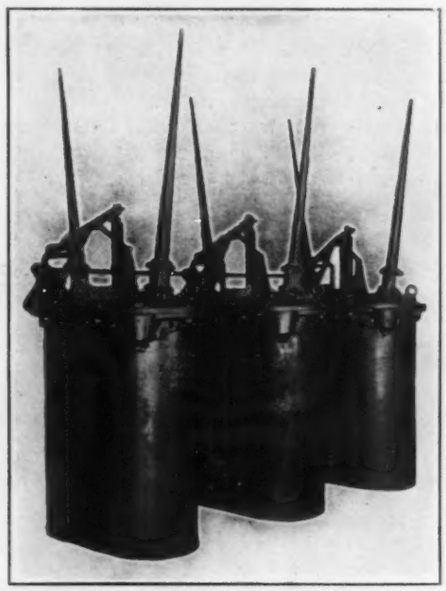
This new type GA breaker consists of single-pole units, each enclosed in its individual boiler-steel tank with separate operating mechanism, leads, etc. All the operating parts are mounted on the cast-iron top, and are operative on the top so that the mechanism may be lined up before it is dropped into the oil tank. Eye bolts are provided for handling this top as a unit. Since the connection between poles is simply a piece of three-fourth-inch gas pipe, the poles may be spaced any convenient distance apart. The pipe is used as a pull rod, being in tension only. It is impossible for the different poles to stick due to improper alignment, as they may be placed several inches out of line without making the angle of pull sufficient to jam the mechanism.

Type GA Oil Circuit Breaker, 60,000 Volts. Breaker Open.

The breaker is made for four voltages: 44,000, 66,000, 88,000 and 110,000 volts. It may be either hand or solenoid-operated and of any number of poles. The automatic circuit-breaker is furnished either for use with series transformers or with a self-contained series trip. Time-limit features may be incorporated if desired.

The breaking capacity is practically unlimited, the heavy boiler steel tanks and cast iron top giving great strength against internal pressure. The total travel of the moving contacts is large, there being two breaks in series at each pole. Each break takes place in a separate compartment, separated from the other pole by double barriers of insulating material. The break is between brass and copper, materials which have been found to give the best protection against burning. Each moving contact piece has its own heavy steel spring to take up any wear due to arcing, and slides across the stationary piece with a rubbing motion, keeping the contacts bright. The insulation features of this breaker are probably superior to those of any device of its character ever designed. While this is in a great measure due to the condenser type of lead, as will be explained, in any type of apparatus the insulation is dependent on the number of paths to ground, or, in other words, the number of insulation points. It will be noted that in this form of circuit breaker there are only three such points, namely, the two leads and the wooden rod. The rod being of moderate cross section, can be easily and thoroughly dried and impregnated, and is well immersed in oil at all times, so that its factor of safety is large.

The condenser type of lead marks probably the greatest advance in high tension work that has been made for some time. The problem of carrying a high tension conductor through a grounded surface has been one of the limiting factors in developing higher voltages. Due to the fact that it was impossible to maintain the same stresses in all layers of insulating material, on account of the unequal distribution of potential in them, excessive amounts of insulation were required to secure safety. It was even found necessary to remove all grounded material from the neighborhood of the conductor, and various further makeshifts have been used, such as oil-filled terminals, double or triple porcelains, and excessive amounts of varnished cloth or paper. In the Westinghouse type G breaker, which is regarded as the standard for 66,000 volt transmissions, providing the protection for both the Niagara and Southern Power Company lines, heavy soapstone tops, varished cambric leads, and expensive and cumbersome porcelains were required. The contrast in the type GA breaker is surprising. A moderate sized lead made up of alternate layers of tinfoil and insulation is fastened solidly into cast iron flanges, and at voltages far in excess of that required to break down former constructions these leads show no static discharge or other evidences of strain.



Type GA Oil Circuit Breaker, 60,000 Volts. 3-Pole Breaker.

The development of this condenser lead has been carefully worked out, expensive machinery for producing it having been installed, and every point in connection with its manufacture is thoroughly covered by patents.

That this breaker is appreciated, is shown by the fact that the Westinghouse Company has supplied or has orders at the present time, over 200 single-pole units for 44,000, 66,000 and 110,000 volt lines, and has other large orders in immediate prospects.

High tension operators and engineers appreciate fully the simplicity, rugged construction and large factors of safety of this device.

NEWS NOTES

FINANCIAL.

DOUGLAS, ARIZ.—The City Council will receive bids up to August 25th for $325,000 water bonds.

MILTON, ORE.—A special election will be called in the near future to vote bonds for $15,000 for the purpose of constructing a new water system.

SANTA BARBARA, CAL.—The City Council has passed an ordinance declaring the regularity of the sale of $40,000 in waterworks extension tunnel bonds of city to James H. Adams & Co.

LA GRANDE, ORE.—The Council has passed an ordinance providing for the issuance of negotiable coupon bonds to the amount of $100,000, to be known as the "Beaver Creek Pipe Line Bonds."

PARK CITY, Utah.—A resolution has been passed fixing Tuesday, September 14th, as the date on which the special election will be held to vote $50,000 bonds for the purpose of installing a new water system.

ST. HELENS, ORE.—At a meeting of the City Council it was unanimously voted to issue bonds for $40,000 for the purpose of providing an adequate water supply. The water commissioners selected were: Messrs. McCormick, Maston, Chas. H. Muckle, Edwin Rose and A. T. Laws.

SAN FRANCISCO, CAL.—The statement of the earnings of the United Railroads of San Francisco for June and the six months ending June 30th, show that gross earnings for that period were $3,568,905, an increase of $227,452 over 1908. The ratio of operating expenses to gross earnings for the six months ending June 30, 1909, was 58.4 per cent, as compared with 66.1 per cent for the same period of 1908.

INCORPORATIONS.

FRESNO, CAL.—Bohemian Oil Company of Hanford, capital stock $500,000, shares $1 each, subscribed $90, by L. S. Chittenden, A. F. Flory, E. W. Houston, W. J. Wilson and others.

FRESNO, CAL.—La Sorpreso Oil Co., capital stock $500,000, shares $1 each, subscribed $7, by same as above.

FRESNO, CAL.—Vallecitus Oil Company, capital stock $42,300, subscribed $4650, by A. M. Field of Tulare, J. L. Butin of Madera, Charles Detoy, H. Ford and Martin Yribarren of Fresno.

LOS ANGELES, CAL.—Lander Oil Syndicate, capital stock $1,000,000, subscribed $700, by R. E. Plunkett, J. North, C. P. Wilcox, F. H. Hamilton, H. Merrill, M. M. Gilchrist and J. P. Wood.

TELEPHONE AND TELEGRAPH.

TACOMA, WASH.—The Council has adopted resolutions instructing the commissioner of public works to prepare estimates of the cost of installing underground conduits for wires.

SAN FRANCISCO, CAL.—The regular annual meeting of the stockholders of the Direct-Line Telephone Company will be held at the office of the company, San Francisco, August 20th, 1909.

REDWOOD CITY, CAL.—The Board of Supervisors has awarded a contract for the installing of a system of conduits for telephone wires to the Palo Alto Electric Works, at a cost of $585.

ONTARIO, ORE.—The Ontario Independent Telephone Company has elected H. B. Grauel president and J. Prinzing secretary. The company expects to have its line built and in operation within three months.

WENATCHEE, WASH.—C. B. Cooper, construction engineer of the United Wireless Telegraph Company, is in the city and will let a contract to a local contractor for a wireless station here as soon as his plans arrive.

OAKLAND, CAL.—At a meeting of the Board of Education at Oakland, the Pacific Telephone & Telegraph Company was awarded the contract to install telephones in the various schools. Heretofore there have been two systems in the schools, the Pacific and the Home telephone.

SAN RAFAEL, CAL.—A contract has been let by the Pacific Telephone & Telegraph Company for the installation of an underground conduit cable in Fourth street from H to Tamalpais avenue and from Fourth to Mission streets, to displace the overhead wires in the main thoroughfares of the town. Included in the improvements will be a 200-pair cable from San Rafael to San Anselmo, with a distributing system from San Anselmo through Landsdale, Ross and Kentfield.

ILLUMINATION.

ASHLAND, ORE.—R. I. Stewart has been awarded the contract for the erection of the municipal hydro-electric power house on his bid for $3343.

MELROSE, CAL.—An election for the formation of an electric light district was held last week and the proposition carried by a vote of 92 to 25.

ST. MARIES, IDAHO.—The Council has passed an ordinance granting a franchise to G. H. Jay to construct and operate a light, heat and power transmission line in St. Maries.

LOS ANGELES, CAL.—The San Bernardino Gas Company will at once commence the construction of its plant at Colton. Z. T. Bell of San Bernardino will be general superintendent of the company.

RHYOLITE, NEV.—Robert Armstrong, who is at the head of a corporation, which proposes to develop into a resort the Shoshone Hot Springs, will install two acetylene gas plants for building and grounds.

SEATTLE, WASH.—The U. S. Senate has passed a deficiency appropriation bill providing $30,000 for completing the illumination at the four goverment buildings at the Alaska-Yukon-Pacific fair grounds. Instead of the 6,000 lights now in use, about 30,000 will burn in the four buildings.

SAN BERNARDINO, CAL.—The San Bernardino Valley Gas Company has taken over the Lytle Creek Power Company's plant here, involving a payment of $125,000. The purchasing corporation was recently organized by Los Angeles and Pasadena capitalists and has bought up the independent gas companies here, and at Redlands and Colton.

TACOMA, WASH.—Frank C. Kelsay, special engineer for the city, has completed surveys for the city power plant and is now at work on the surveys for the transmission line to the city. Plans and details are to be ready so that the contract can be let before the first of the year. A reservoir will be created by a dam 45 feet high and 300 feet long; thirty thousand horsepower will be developed. A tunnel 10,000 feet long will also be constructed and water will be carried across the river by a riveted steel pipe, supported on concrete arches. About a year will be required to build the plant.

TRANSPORTATION.

EL PASO, TEX.—The El Paso Electric Street Railway Company has secured concessions for its extension in Juarez.

NORTH YAKIMA, WASH.—The Yakima Transportation Company will extend its line through Fruitvale. The franchise is for about two miles.

BELLINGHAM, WASH.—The Council has granted a franchise to the Whatcom County Railway & Light Company to construct an extension into Happy Valley.

SAN DIEGO, CAL.—Construction work will be started about September 1st on the one-mile extension of the M street line of the San Diego Electric Railway Company.

OGDEN, UTAH.—The City Council has granted the Salt Lake & Ogden Railway a franchise to conduct a line on Lincoln avenue north of Thirty-first street to the city limits.

ESCONDIDO, CAL.—G. W. Purcell of the San Diego & Escondido Railway Company, has secured entire right of way for construction of the proposed electric line between the two cites.

KLAMATH FALLS, ORE.—The Klamath Falls Transportation Company is letting contracts for rebuilding and electrifying its line, setting 300 poles and expect to spend some $10,000 in present improvements.

BAKER CITY, ORE.—The Baker Interurban Railway Company has been incorporated with $50,000 capital by Thos. B. Neuhausen, A. K. Bentley and Anthony Mohr, to build electric roads from Baker City to surrounding towns.

WENATCHEE, WASH.—A move is on foot to build an electric railway from here to Waterville, and from here to Leavenworth. George H. Ellis, E. M. Tupper and W. R. Powell compose the committee which has the matter in charge.

PASCO, WASH.—It is reported that work on locating the line of the Walla Walla & Columbia River Traction Company is practically completed, according to E. M. Symonds, consulting engineer. This line is to be from the Garden City to Wallula, thence to Pasco.

KLAMATH FALLS, ORE.—Announcement has been made by E. R. Reames, president of the Klamath Falls Land & Transportation Company, that steps are to be taken at once to electrify the street-car system of Klamath Falls. For the past two years the company has been operating a horse car.

FRESNO, CAL.—An ordinance was adopted last week by the Supervisors granting F. S. Granger a franchise for the interurban railway from Hanford to Fresno for the connecting links of the right of way across county roads. According to the ordinance has 90 days after the passage to begin construction work.

TRANSMISSION.

ARCATA, CAL.—J. N. Lentell has filed a claim to 500 inches of water of Jacobey creek for power and water supply.

BEVERLY, WASH.—Thatcher & Travis have filed a water right for 30,000 inches of water on the Columbia river, four miles south of Beverly.

GREAT FALLS, MONT.—Construction has been started on the transmission line of the Great Falls Water Power & Townsite Company, from Great Falls to Butte, 129 miles.

TUCSON, ARIZ.—Under the management of A. M. Conrad the Sonora Copper Co. in the Caracahui mountains, three miles from Sonora railroad, is about to install an electric power plant, and an aerial tramway.

HEPPNER, ORE.—Water rights are being taken on the John Day river, twelve miles above Monument, by H. V. Gates & Co., preliminary to building a power plant to develop 2000 horsepower to supply Heppner with electricity.

PORTLAND, ORE.—Engineers of the Portland Railway, Light and Power Company have been instructed to begin preliminary work at once on a new water power plant at Oregon City, which, when completed, will generate 45,000 horse power.

SANTA FE., N. W.—The Espanola Milling & Elevator Company of Espanola, Rio Arriba county, which will build a 2000 horsepower electric plant on Santa Cruz in Northern at Espanola, has incorporated with $25,000 capital. The directors are Geo. Bond of Trinidad, Colo.; Frank Bond of Espanola and others.

SNOHOMISH, WASH.—The Snohomish Electric & Water Power Company has been bought out by J. B. Wickstrom, electrical engineer of Seattle. The generating plant was burned some time ago, and the company buys current from the Seattle-Tacoma Power Company. Mr. Wickstrom contemplates extensive improvements.

SANDPOINT, IDAHO.—The Northern Idaho & Montana Power Company has commenced work on the construction of its power line from this city to Newport, which will supply power to Newport and all adjacent towns from Sandpoint. Hall, Bylesby & Co., of Chicago, are owners of the plant here Improvements as planned will reach $2,000,000.

HANFORD, WASH.—The Hanford Irrigation & Power Company has let a contract to the Allis-Chalmers Company for a duplication of the present generating system at Priests Rapids, consisting of one 1,000 h. p. vertical, triplex open flume turbine, one oil pressure governor complete, one 900 kilowatt, 60 cycle, 2200 volt vertical alternator; three 400 kilowatt oil filled, water cooled transformers and one switchboard complete.

CHIHUAHUA, MEX.—The Mines of Mexico Co. of Denver, Colo., at the head of which is W. O. Temple of Denver, is taking steps towards the construction of its hydro-electric plant on the Mayo river in western Chihuahua. R. E. Cowden, C. E., of Denver has made the surveys and has returned to Denver to report to his company. He will return next month with R. M. Jones, a hydraulic engineer, to make final surveys, plans, specifications and estimates for the first dam and hydro-electric power plant the Company will build.

WATERWORKS.

SEATTLE, WASH.—The Council has passed an ordinance granting a franchise to Helen Moore Hubbell to lay and operate steam and water pipes in the city of Seattle.

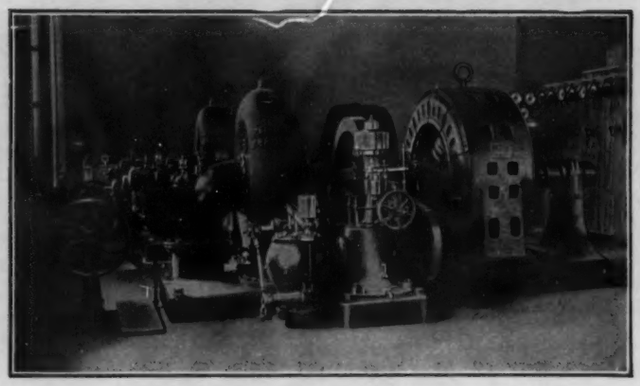
VISALIA, CAL.—The franchise for the construction of a water system at Lindsay has been awarded to the Lindsay Development Company, the amount of the bid being $220.

PORTLAND, CAL.—The Water Board has signified its intention of installing the mains necessary to supply the Mount Scott, Woodstock and Kenilworth districts with Bull Run water at a cost of from $50,000 to $75,000.

LONG BEACH, CAL.—The Long Beach Water Company, which will expend $50,000 in a new pipe line, has filed its bond and Contractor Crane will start the work at once. The pipe will be of steel, encased in reinforced concrete jackets.

SEATTLE, WASH.—Work has commenced on clearing land for a modern reservoir at Spring Brook and the new water system will be constructed at once. A new main six miles long will be laid from Spring Brook to connect with the old system. It is expected to turn water into the new pipes within a year.

Relief Valves
Automatic Governors
Water Saving Devices
Head Gates



Pelton-Francis Turbines Operating under 340' head
Unit Capacity 800 H. P. 900 R. P. M.

Water Power Installations

PELTON Impulse Wheels
Francis Turbines

Efficiency - Speed Regulation - Reliability
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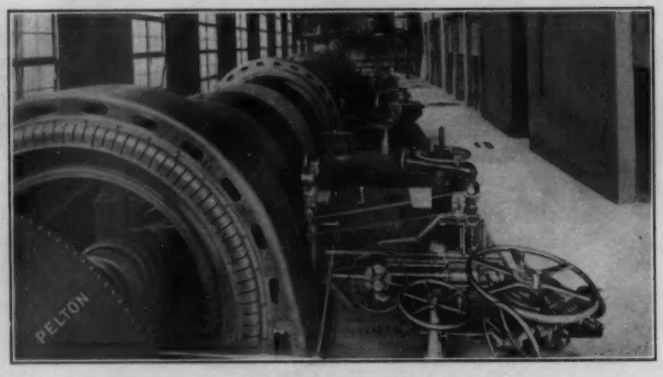

Pelton Impulse Wheel Installation

Pipe Lines
Gate Valves
Water Motors
Regulating Nozzles

THE PELTON WATER WHEEL CO.

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